APPENDIX F

US 9,036,010

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 Title: Transport of stereoscopic image data over a display interface



(12) United States Patent Shepherd

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(54) TRANSPORT OF STEREOSCOPIC IMAGE DATA OVER A DISPLAY INTERFACE

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(GD)

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PCT Pub. Date: Jun. 25, 2009

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(30) Foreign Application Priority Data

Dec. 16, 2007 (Br)

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52) U.S. Cl. CPC H04N 13/0048 (2013.01); H04N 13/0059 (2013.01); H04N 2213/003 (2013.01)

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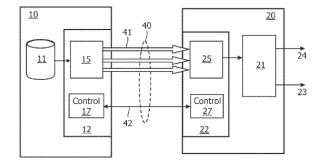
Primary Examiner — Dave Czekaj Assistant Examiner — Nam Pham

JP JP

(57) ABSTRACT

A digital display interface (40) connects a first audio-visual device (10) to a second audio-visual device (20). Stereoscopic image data is transmitter over the display interface (40). Components of stereoscopic image data are multiplexed and inserted into an image data carrying element. An existing deep color mode can be re-used for this purpose. Signaling information to help identify or decode the stereoscopic image data is carried in auxiliary data carrying elements. Stereoscopic image data can be distributed between image data carrying data elements and auxiliary data carrying data elements. Auxiliary data carrying elements can be transmitted in horizontal or vertical blanking periods, and can comprise HDMI Data Island Packets. Stereoscopic image data can be sent over an auxiliary data channel. The auxiliary data channel can form part of the same cable as is used to carry a primary channel of the display interface, a separate cable, or a wireless link.

18 Claims, 3 Drawing Sheets



VESA DisplayPort Standard v1.2

1. A digital display interface part, for use in a first audio-visual device, for supporting a digital display interface between the first audio-visual device and a second audio-visual device, the digital display interface having a known data carrying capacity for transmitting uncompressed pixel information, the interface part comprising:

1.7 Overview of DisplayPort

A DisplayPort link consists of a main link, an auxiliary channel (AUX CH), and a Hot Plug Detect (HPD) signal line.

As shown in Figure 2-45: DisplayPort Data Transport Channels

below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used to transport isochronous data streams such as uncompressed video and audio. The auxiliary channel is a half-duplex bidirectional channel used for link management and device control. The HPD signal also serves as an interrupt request by the Sink device.

In addition, the DisplayPort connector for a box-to-box connection has a power pin for powering either a DisplayPort repeater or a DisplayPort-to-Legacy converter.

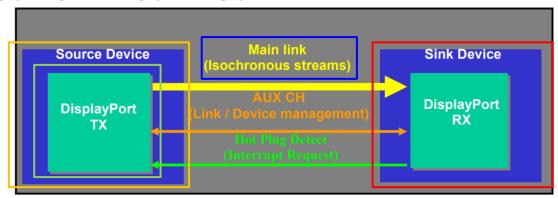


Figure 1-1: DisplayPort Data Transport Channels

Claim 1
1. A digital display
interface part, for use in a
first audio-visual device,
for supporting a digital
display interface between
the first audio-visual
device and a second
audio-visual device, the
digital display interface
having a known data
carrying capacity for
transmitting
uncompressed pixel
information, the interface
part comprising:

VESA DisplayPort Standard v1.2

1.7 Overview of DisplayPort

A DisplayPort link consists of a main link, an auxiliary channel (AUX CH), and a Hot Plug Detect (HPD) signal line.

As shown in Figure 2-45: DisplayPort Data Transport Channels

below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used to transport isochronous data streams such as uncompressed video and audio. The auxiliary channel is a half-duplex bidirectional channel used for link management and device control. The HPD signal also serves as an interrupt request by the Sink device.

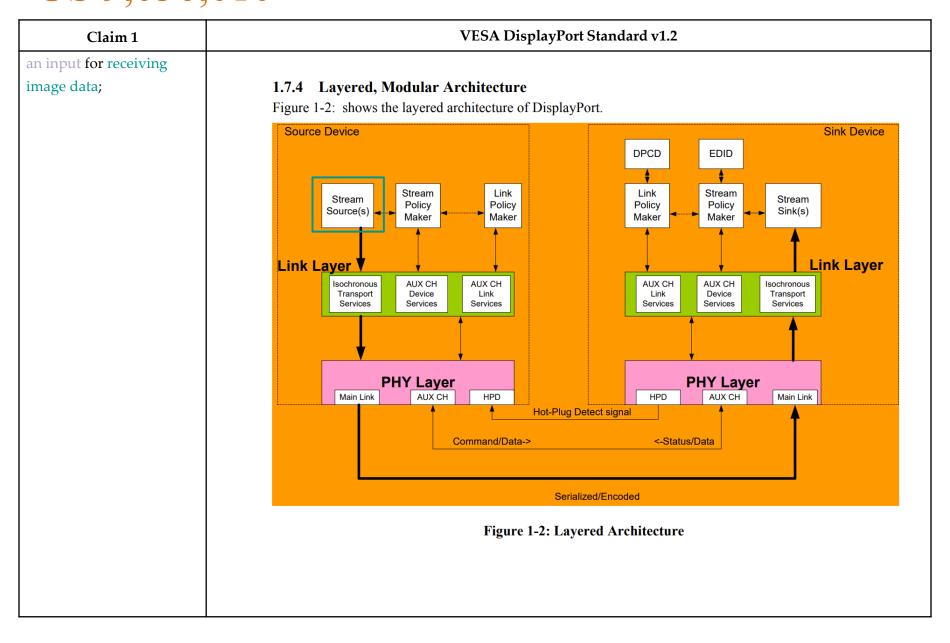
In addition, the DisplayPort connector for a box-to-box connection has a power pin for powering either a DisplayPort repeater or a DisplayPort-to-Legacy converter.

1.7.1 Make-up of the Main Link

The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes). AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.

Three link rates are supported, 5.4Gbps, 2.7Gbps and 1.62Gbps per lane. All enabled lanes must be operating at the same link rate. The link rate is decoupled from the pixel rate. The pixel rate is regenerated from the link symbol clock using the time stamp values M and N. The capabilities of the DisplayPort transmitter and receiver, and the quality of the channel (or a cable) will determine whether the link rate is set to 5.4Gbps, 2.7Gbps or 1.62Gbps per lane.

Claim 1	VESA DisplayPort Standard v1.2
an input for receiving image data;	2.2.1 Main Stream to Main Link Lane Mapping in the Source Device The Main Link must have one, two, or four lanes, with each lane capable of transporting eight bits of data per link symbol clock (LS_Clk). Main stream data (the uncompressed video stream) must be packed, stuffed, framed and, optionally, multiplexed with secondary-data and inter-lane skewed before it is handed over to the PHY layer after the Link Layer data mapping for transport over the main link. The stream data must enter the link layer at the original stream clock (Strm_Clk) rate and must be delivered to the PHY layer at the LS_Clk rate after this mapping.
	Native Stream CLK(s) domain Lane N Secondary data Packet Pa



a formatter arranged to format the data for transport over the interface, wherein the formatter, in accordance with signal information received from the second audio-device, is operable

in:

VESA DisplayPort Standard v1.2

2.2.1 Main Stream to Main Link Lane Mapping in the Source Device

The Main Link must have one, two, or four lanes, with each lane capable of transporting eight bits of data per link symbol clock (LS_Clk). Main stream data (the uncompressed video stream) must be packed, stuffed, framed and, optionally, multiplexed with secondary-data and inter-lane skewed before it is handed over to the PHY layer after the Link Layer data mapping for transport over the main link. The stream data must enter the link layer at the original stream clock (Strm_Clk) rate and must be delivered to the PHY layer at the LS_Clk rate after this mapping.

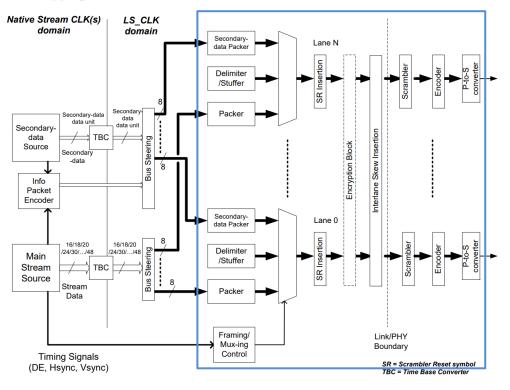


Figure 2-8: High Level Block Diagram of DP uPacket TX Main Link Data Path

Claim 1
a formatter arranged to
format the data for
transport over the
interface, wherein the
formatter, in accordance
with signal information
received from the second
audio-device, is operable
in:

VESA DisplayPort Standard v1.2

2 Link Layer

2.1 SST Mode Introduction

This section describes the services provided by the link layer of DisplayPort in SST (single stream transport) mode. (Those sub-sections in this section that are applicable to both SST and MST modes are explicitly noted in the sub-section titles.) These services are:

• Isochronous transport services over the main link

The isochronous transport services, based on a micro-packet architecture, maps the video and audio streams onto the Main Link symbols with a set of rules, (explained in Section 2.2), so that the streams can be correctly re-constructed into the original format and time base in the Sink device.

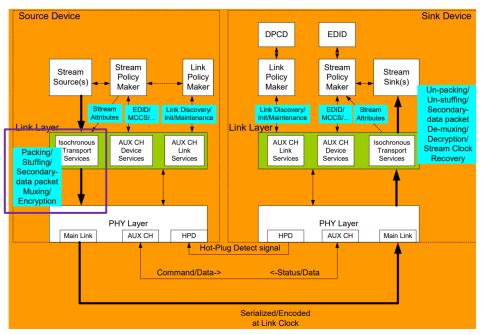


Figure 2-1: Overview of Link Layer Services

Claim 1 a formatter arranged to format the data for transport over the interface, wherein the formatter, in accordance with signal information received from the second audio-device, is operable in:

VESA DisplayPort Standard v1.2

2 Link Layer

2.1 SST Mode Introduction

This section describes the services provided by the link layer of DisplayPort in SST (single stream transport) mode. (Those sub-sections in this section that are applicable to both SST and MST modes are explicitly noted in the sub-section titles.) These services are:

• Link and device management services over the AUX CH

Link services are used for discovering, configuring, and maintaining the link. The AUX CH read/write access to DPCD (DisplayPort Configuration Data) address is used for these purposes. Device services support device-level applications such as EDID read and MCCS control. In addition, the AUX CH may be used for optional content protection.

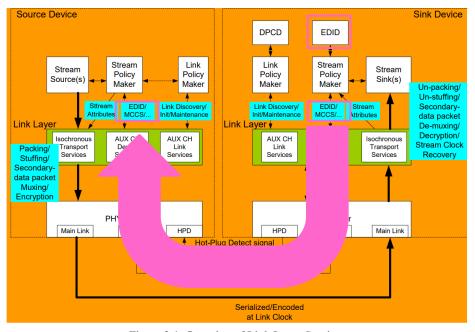


Figure 2-1: Overview of Link Layer Services

Claim 1	VESA DisplayPort Standard v1.2
a formatter arranged to format the data for transport over the interface, wherein the formatter, in accordance with signal information received from the second audio-device, is operable in:	2.3.3 Policy Maker AUX CH Management There are multiple applications and services that initiate AUX transactions. Some examples are: • AUX Link Services • Link capability read • Link configuration (training) • Link status read • AUX Device Services • EDID read • MCCS (Monitor Command and Control Set) control 2.9.1 Stream Transport Initiation Sequence The Stream Source Policy Maker, before transport initiation, must take the following actions: • Read EDID from the Sink device • Set stream attributes for Main Stream attribute data and CEA 861-C InfoFrame generation • Optionally (recommended), get the following information from the Link Policy Maker • Link configuration: Total link bandwidth • To avoid oversubscription of the link bandwidth • RX capability: Number and types of ports available in RX • To determine the number and types of streams that may be transported • Link status: Synchronized? Excessive error symbols? • To make sure that the link is ready for transport

Claim 1	VESA DisplayPort Standard v1.2		
a formatter arranged to format the data for transport over the interface, wherein the		Iress Mapping for Link Configuration/Management ows the DisplayPort address mapping for DPCD. The DPCD is byte addressed. Table 2-75: Address Mapping for DPCD (DisplayPort Configuration Data	n)
formatter, in accordance with signal information	DisplayPort Address	Definition	Read/Write over AUX CH
received from the second		Receiver Capability Field	
audio-device, is operable in:	00000h	DPCD_REV: DPCD revision number Bits 3:0 = Minor revision number Bits 7:4 = Major revision number 10h for DPCD Rev.1.0 11h for DPCD Rev.1.1 12h for DPCD Rev.1.2 A DP device with uPacket RX with a DPCD Revision number of 1.2 and above must support GUID at DPCD Addresses 00030h ~ 0003Fh. Furthermore, a DP Sink device with DPCD Rev.1.2 with a stereo display capability support (as declared in EDID and Display ID) must support the handling of 3D Stereo inband signaling using Video_Stream_Configuration (VSC) Packet. Note: The DPCD revision number does not necessarily match the DisplayPort version number.	Read Only
	The 3D stereo with specific ti don't. Furthern format is support	dix H: Protocol Support for 3D Stereo Display reo Display Capability Declaration capability can be exposed in EDID and DisplayID. A 3D stereo format is usual ming and hence it is desirable to indicate which timings support 3D stereo for more, for a given timing that supports 3D stereo format it is required to indicate orted. Both EDID and DisplayID have the ability to expose 3D stereo capability ides for a more efficient and flexible format declaration.	mat and which e which stereo

a first mode to generate a stream of first data elements, said first data elements, said first data element comprising pixel data of a 2D image, at a data carrying capacity no greater than said known data carrying capacity; and, **Output Description of the video stream of the video stream by the Sink. The attribute data is sent once per frame during the vertical blanking per main video stream. Those attributes must be as follows: **Miscellaneous1 (MISC1, 8 bits) **Output Streeo video attribute (bits 2:1) **Output Description of the video stream by the Sink. The attribute data is sent once per frame during the vertical blanking per main video stream. Those attributes must be as follows: **Output Description of the video stream by the Sink. The attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute (bits 2:1) **Output Description of the video stream by the Sink. The attribute data that are transported for the reproduction of the video stream by the Sink. The attribute data that are transported for the reproduction of the video stream by the Sink. The attribute data that are transported for the reproduction of the video stream by the Sink. The attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the vertical blanking per main video stream. Those attribute data is sent once per frame during the video stream stribute data that are transported or the induction of the video stream. Those attribute data that are transported or the video stream. Those attribute data that are transported or the video s	
o Stereo video attribute (bits 2:1) • O0 = No 3D stereo video in-band signaling done using this field, indicating either no stereo video transported or the in-band signaling done using an SDP called Video_Stream_Configuration (VSC) Packet 2.2.5.6 Video_Stream_Configuration (VSC) Packet A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet field bits 2:1 to 00. 2.2.5.6.2 VSC Packet Payload	
greater than said known data carrying capacity; and, • 00 = No 3D stereo video in-band signaling done using this field, indicating either in stereo video transported or the in-band signaling done using an SDP called Video_Stream_Configuration (VSC) Packet 2.2.5.6 Video_Stream_Configuration (VSC) Packet A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet field bits 2:1 to 00. 2.2.5.6.2 VSC Packet Payload	
data carrying capacity; and, stereo video transported or the in-band signaling done using an SDP called Video_Stream_Configuration (VSC) Packet 2.2.5.6 Video_Stream_Configuration (VSC) Packet A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet field bits 2:1 to 00. 2.2.5.6.2 VSC Packet Payload	
Table below snows the bit definitions of VSC Packet payload	
Table 2-56: VSC Packet Payload	
DB0 bits 3:0 DB0 bits 7:4	
= Stereo Interface Method Code = Stereo Interface Method-Specific Param 0 = Non Stereo Video Must be set to 0x0	ımeter

Claim 1	VESA DisplayPort Standard v1.2
a first mode to generate a	
stream of first data	1.7.1 Make-up of the Main Link
elements, said first data	The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes).
element comprising pixel	AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.
data of a 2D image, at a	The stream data is packed into "micro-packets" which are called "transfer units" in SST (Single Stream
data carrying capacity no	Transport) mode and MTP (Multi-stream Transport Packet) in MST (Multi-Stream Transport) mode. After
greater than said known	the stream data is packed and mapped to main link, the packed stream data rate will be equal to or smaller than the link symbol rate of the main link. When it is smaller, stuffing symbols are inserted.
data carrying capacity;	than the link symbol face of the main link. When it is smaller, starting symbols are inserted.
and,	2.2.1.4 Symbol Stuffing and Transfer Unit To avoid the oversubscription of the link bandwidth, the packed data rate must be equal to or lower than the link symbol rate. When the packed data rate is lower than the link symbol rate, the link layer must perform symbol stuffing. Stuffing symbols (both stuffing frame symbols and dummy data symbols) must be inserted in all lanes in the same LS_Clk cycle before inter-lane skewing. The dummy data symbols must be all 00h before scrambling. The dummy data symbols are inserted both between FS and FE, and between BS and BE.

 a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being 2.2.4 Main Stream Attribute Data Transport This section describes the Main Stream attribute data that are transported for the reproduction of the main video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the main video stream. Those attributes must be as follows: Miscellaneous (MISC1, 8 bits) Stereo video attribute (bits 2:1) 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D stereo video transported or the in-band signaling done using an SDP called Video_Stream_Configuration (VSC) Packet 	Claim 1	VESA DisplayPort Standard v1.2
transmitted in a first portion of said interface and in a second portion of said interface,	a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of	 2.2.4 Main Stream Attribute Data Transport This section describes the Main Stream attribute data that are transported for the reproduction of the main video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the main video stream. Those attributes must be as follows: Miscellaneous1 (MISC1, 8 bits) Stereo video attribute (bits 2:1) 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D stereo video transported or the in-band signaling done using an SDP called

Claim 1	VESA DisplayPo	rt Standard v1.2
a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components	field bits 2:1 to 00. 2.2.5.6.2 VSC Packet Payload Table below shows the bit definitions of VSC Packet	gnaling using VSC Packet by setting MSA Packet MISC1
of said stereoscopic image	= Stereo Interface Method Code	= Stereo Interface Method-Specific Parameter
elements being transmitted in a first portion of said interface and in a second portion of said interface,	1 = Frame/Field Sequential (Figure 6, illustrates the composited frame format as transmitted by the source)	Frame/Field Sequential Type: Value 0x0: Left & Right view indication based on the MISC1 bit 2:1 Value 0x1: Right when Stereo Signal = 1 Value 0x2: Left when Stereo Signal = 1 All other values for this field (0x3-0xF) are RESERVED for future use.
	2 = Stacked Frame (Figure 7, illustrates the composited frame format as transmitted by the source) 3 = Pixel Interleaved	Stacked Frame Type: Value 0x0: Left view is on top and right view on bottom All other values for this field (0x1-0xF) are RESERVED for future use. Interleave Pattern Type: For interleave pattern type 1 through 4, a 2x2 pattern

VESA DisplayPort Standard v1.2

a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

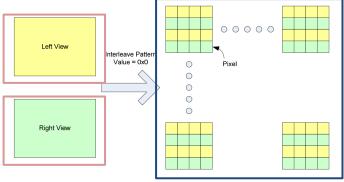


Figure 2-29: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines

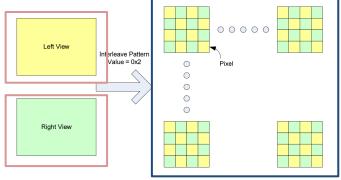


Figure 2-30: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines

a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

VESA DisplayPort Standard v1.2

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

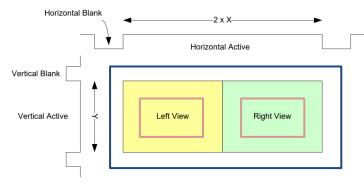


Figure 2-31: Interleave Pattern Corresponding to a Checkerboard Pattern with Alternating Left and Right Image Pixels

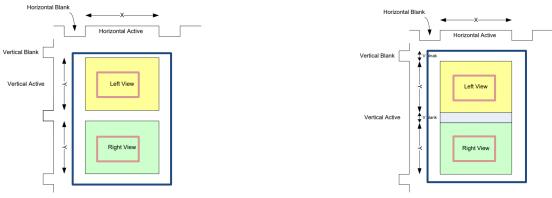


Figure 2-32: Field Sequential Stereo Format with Left View and Right View Indicated via MISC1 bits

Figure 2-33: Stacked Top, Bottom Stereo Format with Left View on Top and Right View on Bottom

2:1 Field of the MSA

a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

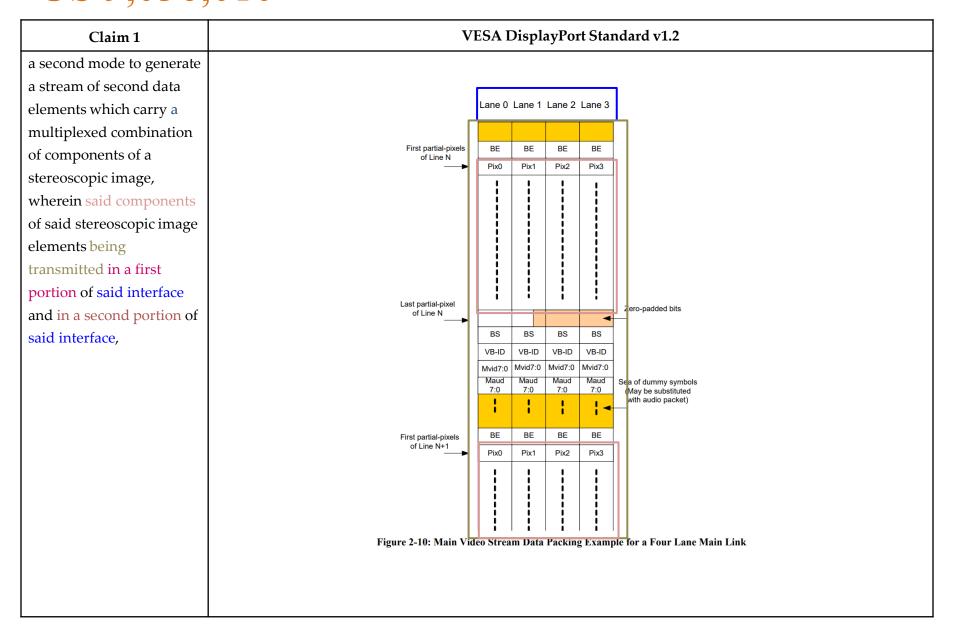
VESA DisplayPort Standard v1.2

2.2.1.3 Main Video Stream Data Packing

The link layer must first steer pixel data in a pixel-within-lane manner as shown in Table 2-2.

Table 2-2: Pixel Steering into Main Link Lanes

Number of Lanes	Pixel Steering (N is 0 or positive integer)
4	Pixel 4N to lane 0
	Pixel 4N+1 to lane 1
	Pixel 4N+2 to lane 2
	Pixel 4N+3 to lane 3
2	Pixel 2N to lane 0
	Pixel 2N+1 to lane 1
1	All pixels to lane 0



a second mode to generate
a stream of second data
elements which carry a
multiplexed combination
of components of a
stereoscopic image,
wherein said components
of said stereoscopic image
elements being
transmitted in a first
portion of said interface
and in a second portion of
said interface,

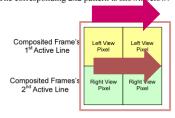
VESA DisplayPort Standard v1.2

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

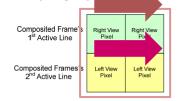
Value 0x0:

Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on even lines. The corresponding 2x2 pattern is shown below:



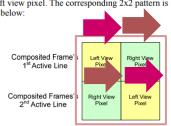
Value 0x1:

Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on odd lines. The corresponding 2x2 pattern is shown clow:

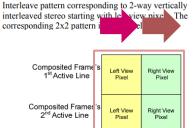


Value 0x2:

Interleave pattern corresponding to a checkerboard pattern with alternating left and right view pixels starting with left view pixel. The corresponding 2x2 pattern is shown below:



Value 0x3:



Value 0x4:

Interleave pattern corresponding to 2-way vertically interleaved stereo starting with right view pixels. The corresponding 2x2 pattern is shown below:

Composited Frame S Right View Pixel Left View Pixel Pixel Left View Pixel Pi

2:1 Field of the MSA

Claim 1

a second mode to generate a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image, wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

VESA DisplayPort Standard v1.2

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

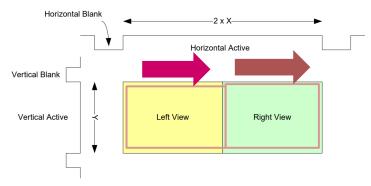
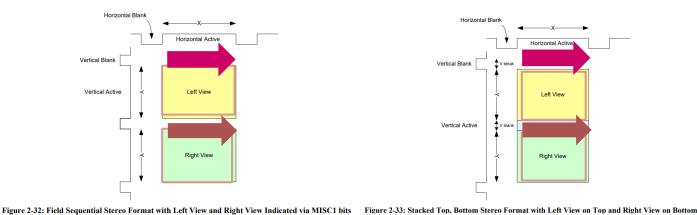


Figure 2-31: Interleave Pattern Corresponding to a Checkerboard Pattern with Alternating Left and Right Image Pixels



VESA DisplayPort Standard v1.2 Claim 1 a second mode to generate a stream of second data Value 0x0: elements which carry a Lane 0 Lane 1 Lane 2 Lane 3 Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on even multiplexed combination lines. The corresponding 2x2 pattern is shown below: BE First partial-pixels BE BE of components of a of Line N Pix2 Pix3 stereoscopic image, wherein said components Composited Frame's Left View Left View of said stereoscopic image 1st Active Line Pixel Pixel elements being transmitted in a first Composited Frames's Right View Right View 2nd Active Line Pixel Pixel portion of said interface Last partial-pixel o-padded bits of Line N and in a second portion of BS VB-ID VB-ID VB-ID VB-ID said interface, Mvid7:0 Mvid7:0 Mvid7:0 Maud Maud Maud Maud Sea of dummy symbols (May be substituted 00000 7:0 7:0 7:0 7:0 Left View with audio packet) In erleave Pattern Value = 0x0 BE First partial-pixels of Line N+1 Pix0 Pix1 Pix2 Pix3 Right View Figure 2-29: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines Figure 2-10: Main Video Stream Data Packing Example for a Four Lane Main Link

VESA DisplayPort Standard v1.2 Claim 1 a second mode to generate Value 0x2: a stream of second data Interleave pattern corresponding to a checkerboard elements which carry a Lane 0 Lane 1 Lane 2 Lane 3 pattern with alternating left and right view pixels starting with left view pixel. The corresponding 2x2 pattern is multiplexed combination shown below: BE First partial-pixels BE of components of a of Line N Pix0 Pix2 Pix3 stereoscopic image, wherein said components Composited Frame's Left View Right View 1st Active Line Pixel of said stereoscopic image Pixel elements being transmitted in a first Composited Frames's Right View Left View 2nd Active Line Pixel Pixel portion of said interface Last partial-pixel Zero-padded bits of Line N and in a second portion of BS VB-ID VB-ID VB-ID VB-ID said interface, Mvid7:0 Mvid7:0 Mvid7:0 00000 Maud Maud Maud Maud Sea of dummy symbols (May be substituted 7:0 7:0 7:0 7:0 Interleave Pattern with audio packet) First partial-pixels of Line N+1 Pix2 Pix3 Right View Figure 2-30: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines Figure 2-10: Main Video Stream Data Packing Example for a Four Lane Main Link

Claim 1	VESA DisplayPort Standard v1.2
each of said first portion	
and said second portion	1.7.1 Make-up of the Main Link
having a lesser data	The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes).
carrying capacity than	AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.
said known data carrying	The stream data is packed into "micro-packets" which are called "transfer units" in SST (Single Stream
capacity and a combined	Transport) mode and MTP (Multi-stream Transport Packet) in MST (Multi-Stream Transport) mode. After
data carrying capacity no	the stream data is packed and mapped to main link, the packed stream data rate will be equal to or smaller than the link symbol rate of the main link. When it is smaller, stuffing symbols are inserted.
greater than said known	than the link symbol rate of the main link. When it is smaller, starting symbols are inserted.
data carrying capacity,	2.2.1.4 Symbol Stuffing and Transfer Unit
	To avoid the oversubscription of the link bandwidth, the packed data rate must be equal to or lower than the link symbol rate. When the packed data rate is lower than the link symbol rate, the link layer must perform symbol stuffing. Stuffing symbols (both stuffing frame symbols and dummy data symbols) must be inserted in all lanes in the same LS_Clk cycle before inter-lane skewing. The dummy data symbols must be all 00h before scrambling. The dummy data symbols are inserted both between FS and FE, and between BS and BE.

Claim 1	VESA DisplayPort Standard v1.2			
wherein the interface part is arranged to send signaling information	2.2.4 Main Stream Attribute Data Transport This section describes the Main Stream attribute data that are transported for the reproduction of the main video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of main video stream. Those attributes must be as follows:			
across the interface, the signaling information	Miscellaneous1 (MISC1, 8 bits)			
identifying which mode the formatter is using and characteristics of said steam of second data elements.	 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D stereo video transported or the in-band signaling done using an SDP called Video Stream Configuration (VSC) Packet 01 For progressive video, the next frame is RIGHT EYE For interlaced video, TOP field is RIGHT EYE and BOTTOM field is LEFT EYE 10 = RESERVED 11 For progressive video, the next frame is LEFT EYE For interlaced video, TOP field is LEFT EYE and BOTTOM field is RIGHT eye 2.2.5.6 Video Stream Configuration (VSC) Packet 			
	A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.			

Claim 1
wherein the interface part
is arranged to send
signaling information
across the interface, the
signaling information
identifying which mode
the formatter is using and
characteristics of said
steam of second data
elements.

VESA DisplayPort Standard v1.2

2.2.5.6 Video_Stream_Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

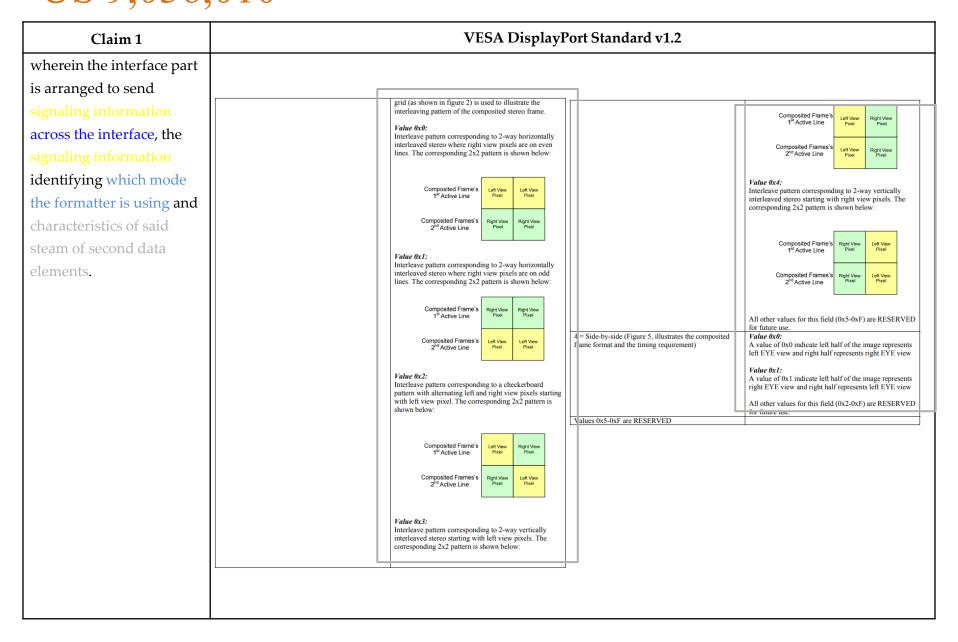
2.2.5.6.2 VSC Packet Payload

Table below shows the bit definitions of VSC Packet payload

Table 2-56: VSC Packet Payload

DB0 bits 3:0	DD0 Lt. 7.4
= Stereo Interface Method Code	= Stereo Interface Method-Specific Parameter
0 = Non Stereo Video	Must be set to 0x0
1 = Frame/Field Sequential (Figure 6, illustrates the composited frame format as transmitted by the source)	Frame/Field Sequential Type:
	Value 0x0:
	Left & Right view indication based on the MISC1 bit 2:1
	Value 0x1:
	Right when Stereo Signal = 1
	Value 0x2:
	Left when Stereo Signal = 1
	All other values for this field (0x3-0xF) are RESERVED for future use.
2 = Stacked Frame (Figure 7, illustrates the composited frame format as transmitted by the source)	Stacked Frame Type:
	Value 0x0:
	Left view is on top and right view on bottom
	All other values for this field (0x1-0xF) are RESERVED for future use.
3 = Pixel Interleaved	Interleave Pattern Type:
	For interleave pattern type 1 through 4, a 2x2 pattern

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VESA DisplayPort Standard v1.2

12. A digital display interface part for use in an audio-visual device, said interface part supporting a digital display interface having a known data carrying capacity between the audio-visual device and a second audio-visual device, and receiving uncompressed pixel information, the interface part comprising:

1.7 Overview of DisplayPort

A DisplayPort link consists of a main link, an auxiliary channel (AUX CH), and a Hot Plug Detect (HPD) signal line.

As shown in Figure 2-45: DisplayPort Data Transport Channels

below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used below, the Main Link is a unidirectional, high-bandwidth and low-latency channel used to transport isochronous data streams such as uncompressed video and audio. The auxiliary channel is a half-duplex bidirectional channel used for link management and device control. The HPD signal also serves as an interrupt request by the Sink device.

In addition, the DisplayPort connector for a box-to-box connection has a power pin for powering either a DisplayPort repeater or a DisplayPort-to-Legacy converter.

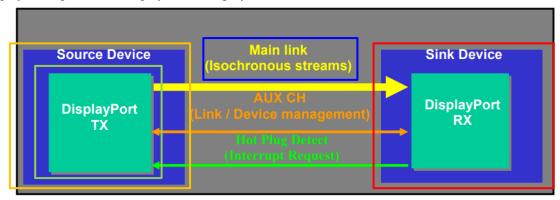


Figure 1-1: DisplayPort Data Transport Channels

VESA DisplayPort Standard v1.2

12. A digital display interface part for use in an audio-visual device, said interface part supporting a digital display interface having a known data carrying capacity between the audio-visual device and a second audio-visual device, and receiving uncompressed pixel information, the interface part comprising:

1.7 Overview of DisplayPort

A DisplayPort link consists of a main link, an auxiliary channel (AUX CH), and a Hot Plug Detect (HPD) signal line.

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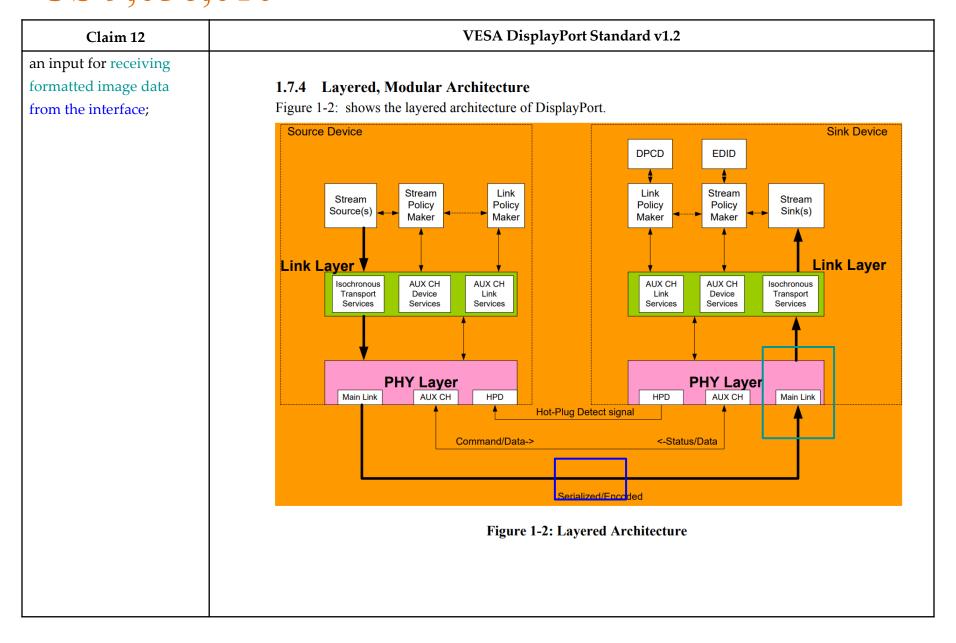
In addition, the DisplayPort connector for a box-to-box connection has a power pin for powering either a DisplayPort repeater or a DisplayPort-to-Legacy converter.

1.7.1 Make-up of the Main Link

The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes). AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.

Three link rates are supported, 5.4Gbps, 2.7Gbps and 1.62Gbps per lane. All enabled lanes must be operating at the same link rate. The link rate is decoupled from the pixel rate. The pixel rate is regenerated from the link symbol clock using the time stamp values M and N. The capabilities of the DisplayPort transmitter and receiver, and the quality of the channel (or a cable) will determine whether the link rate is set to 5.4Gbps, 2.7Gbps or 1.62Gbps per lane.

Claim 12	VESA DisplayPort Standard v1.2				
an input for receiving formatted image data from the interface;	2.2.1 Main Stream to Main Link Lane Mapping in the Source Device The Main Link must have one, two, or four lanes, with each lane capable of transporting eight bits of data per link symbol clock (LS_Clk). Main stream data (the uncompressed video stream) must be packed, stuffed, framed and, optionally, multiplexed with secondary-data and inter-lane skewed before it is handed over to the PHY layer after the Link Layer data mapping for transport over the main link. The stream data must enter the link layer at the original stream clock (Strm_Clk) rate and must be delivered to the PHY layer at the LS_Clk rate after this mapping.				
	LS, CLK domain Secondary- data Packet Lone Notive Stream CLK(s) domain Secondary- data sink Bluenan Lane Notive Stream CLK(s) domain Secondary- data sink Bluenan Ling Stream Stream Sink De-mux Control TBR - Time Base Secovery unit TBR				



Claim 12 VESA DisplayPort Standard v1.2 a processor arranged to Main Stream to Main Link Lane Mapping in the Source Device extract said image data, The Main Link must have one, two, or four lanes, with each lane capable of transporting eight bits of data per the processor being link symbol clock (LS Clk). Main stream data (the uncompressed video stream) must be packed, stuffed, operable, in accordance framed and, optionally, multiplexed with secondary-data and inter-lane skewed before it is handed over to the PHY layer after the Link Layer data mapping for transport over the main link. The stream data must enter the with capabilities of said link layer at the original stream clock (Strm Clk) rate and must be delivered to the PHY layer at the LS Clk second audio-visual rate after this mapping. device, wherein LS_CLK domain Secondarydata Packet De-steering Mair Stream Unpacker Secondary-Lane 0 data Packet De-steering /24/30/.../48 TBC Main

Figure 2-9: High Level Block Diagram of DP uPacket RX Main Link Data Path

Stream Unpacker Secondary-

data Packet

TBR

TBR/TG

PHY/Link

Boundary

TBR = T me Base Recovery unit

TBC = Time Base Conve

De-mux Control Native Stream CLK(s)

domain

Info Packet Decoder

Main

Stream Sink

Secondarydata Sink

Secondary-data data unit

Secondary

To Secondary-data TBR & TBR/TG

16/18/20

Stream

Data

Timing Signals

(DE, Hsync, Vsync)

VESA DisplayPort Standard v1.2			
2 Link Layer			
 2.1 SST Mode Introduction This section describes the services provided by the link layer of DisplayPort in SST (single stream transport) mode. (Those sub-sections in this section that are applicable to both SST and MST modes are explicitly noted in the sub-section titles.) These services are: Isochronous transport services over the main link The isochronous transport services, based on a micro-packet architecture, maps the video and audio streams onto the Main Link symbols with a set of rules, (explained in Section 2.2), so that the streams can be correctly re-constructed into the original format and time base in the Sink device. 			
Stream Stream Policy Maker Policy Maker Policy Maker Sink Device Scondary-data packet Device Services Services Services Services Services Serialized/Encoded Stream Policy Maker Stream Policy Maker Sink(\$) Un-packing/ Un-sufffing/ Secondary-data packet Device Services Ser			

Figure 2-1: Overview of Link Layer Services

Claim 12	VESA DisplayPort Standard v1.2				
a processor arranged to extract said image data,	2 Link Layer				
the processor being	2.1 SST Mode Introduction This section describes the services provided by the link layer of DisplayPort in SST (single stream transport) mode. (Those sub-sections in this section that are applicable to both SST and MST modes are explicitly note in the sub-section titles.) These services are:				
operable, in accordance with capabilities of said					
second audio-visual	Link and device management services over the AUX CH				
device, wherein	Link services are used for discovering, configuring, and maintaining the link. The AUX CH read/write access to DPCD (DisplayPort Configuration Data) address is used for these purposes. Device services support device-level applications such as EDID read and MCCS control. In addition the AUX CH may be used for optional content protection.				
	Source Device DPCD EDID A Bright Device				
	Stream Source(s) Stream Policy Maker Stream Policy Maker Stream Policy Maker Stream Sink(s) Un-packing/				
	Sttream Attributes Link Layer Link Discovery/ Init/Maintenance Link Layer Un-stuffing/ Secondary-data packet De-muxing/				
	Isochronous AUX CH Device Services Services				

PHY Layer

AUX CH

HPD

Command/Data->

Figure 2-1: Overview of Link Layer Services

↑ Hot-Plug Detect signal

PHY Layer

AUX CH

Main Link

HPD

Serialized/Encoded at Link Clock

<-Status/Data

Claim 12	VESA DisplayPort Standard v1.2				
a processor arranged to extract said image data, the processor being operable, in accordance		dress Mapping for Link Configuration/Management ows the DisplayPort address mapping for DPCD. The DPCD is byte addressed. Table 2-75: Address Mapping for DPCD (DisplayPort Configuration Data	a)		
with capabilities of said second audio-visual	DisplayPort Address	Definition	Read/Write over AUX CH		
device, wherein		Receiver Capability Field			
	00000h	DPCD_REV: DPCD revision number Bits 3:0 = Minor revision number Bits 7:4 = Major revision number 10h for DPCD Rev.1.0 11h for DPCD Rev.1.1 12h for DPCD Rev 1.2 A DP device with uPacket RX with a DPCD Revision number of 1.2 and above must support GUID at DPCD Addresses 00030h ~ 0003Fh. Furthermore, a DP Sink device with DPCD Rev.1.2 with a stereo display capability support (as declared in EDID and Display ID) must support the handling of 3D Stereo inband signaling using Video_Stream_Configuration (VSC) Packet. Note: The DPCD revision number does not necessarily match the DisplayPort version number.	Read Only		
	The 3D stereo of with specific tindon't. Furthern format is support	dix H: Protocol Support for 3D Stereo Display reo Display Capability Declaration capability can be exposed in EDID and DisplayID. A 3D stereo format is usual ming and hence it is desirable to indicate which timings support 3D stereo formore, for a given timing that supports 3D stereo format it is required to indicate orted. Both EDID and DisplayID have the ability to expose 3D stereo capability vides for a more efficient and flexible format declaration.	mat and which e which stereo		

Claim 12	VESA DisplayPort Standard v1.2	
in a first mode, the	2.2.4 Main Stream Attribute Data Transport	
processor extracts pixel	•	data that are transported for the reproduction of the main
image data for a 2D image	video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the	
from a stream of first data	main video stream. Those attributes must be as for	ollows:
elements at a data	 Miscellaneous1 (MISC1, 8 bits) 	
carrying capacity no	 Stereo video attribute (bits 2:1) 	
greater than said known	• 00 = No 3D stereo video in-band	signaling done using this field, indicating either no 3D
data carrying capability;	stereo video transported or the in-band signaling done using an SDP called	
and,	Video_Stream_Configuration (VSC) Packet 2.2.5.6 Video_Stream_Configuration (VSC) Packet A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.	
	2.2.5.6.2 VSC Packet Payload	
	Table below shows the bit definitions of VSC Pac	cket payload
	Table 2-56	: VSC Packet Payload
	DB0 bits 3:0	DB0 bits 7:4
	= Stereo Interface Method Code 0 = Non Stereo Video	= Stereo Interface Method-Specific Parameter Must be set to 0x0

Claim 12	VESA DisplayPort Standard v1.2	
in a first mode, the		
processor extracts pixel	1.7.1 Make-up of the Main Link	
image data for a 2D image	The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes).	
from a stream of first data	AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.	
elements at a data	The stream data is packed into "micro-packets" which are called "transfer units" in SST (Single Stream	
carrying capacity no	Transport) mode and MTP (Multi-stream Transport Packet) in MST (Multi-Stream Transport) mode. After	
greater than said known	the stream data is packed and mapped to main link, the packed stream data rate will be equal to or smaller than the link symbol rate of the main link. When it is smaller, stuffing symbols are inserted.	
data carrying capability;	and the symbol ture of the man than the symbol of the motive.	
and,	2.2.1.4 Symbol Stuffing and Transfer Unit	
	To avoid the oversubscription of the link bandwidth, the packed data rate must be equal to or lower than the link symbol rate. When the packed data rate is lower than the link symbol rate, the link layer must perform symbol stuffing. Stuffing symbols (both stuffing frame symbols and dummy data symbols) must be inserted in all lanes in the same LS_Clk cycle before inter-lane skewing. The dummy data symbols must be all 00h before scrambling. The dummy data symbols are inserted both between FS and FE, and between BS and BE.	

in a second mode, the processor demultiplexes components of a stereoscopic image from a stream of second data 2.2.4 Main Stream Attribute Data Transport This section describes the Main Stream attribute data that are transported for the reproduction of the main video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the main video stream. Those attributes must be as follows: • Miscellaneous1 (MISC1, 8 bits)	Claim 12	VESA DisplayPort Standard v1.2
elements which carry a multiplexed combination of components of a stereoscopic image, Stereo video attribute (bits 2:1) • 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D stereo video Transported or the in-band signaling done using an SDP called Video_Stream_Configuration (VSC) Packet	in a second mode, the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a	 2.2.4 Main Stream Attribute Data Transport This section describes the Main Stream attribute data that are transported for the reproduction of the main video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the main video stream. Those attributes must be as follows: Miscellaneous1 (MISC1, 8 bits) Stereo video attribute (bits 2:1) • 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D stereo video transported or the in-band signaling done using an SDP called

Claim 12	VESA DisplayPort Standard v1.2
in a second mode, the	
processor demultiplexes	2.2.5.6 Video_Stream_Configuration (VSC) Packet
components of a	A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1
stereoscopic image from a	field bits 2:1 to 00.
stream of second data	2.2.5.6.2 VSC Packet Payload
elements which carry a	Table below shows the bit definitions of VSC Packet payload
multiplexed combination	Table 2-56: VSC Packet Payload
of components of a	DB0 bits 3:0 DB0 bits 7:4
*	= Stereo Interface Method Code = Stereo Interface Method-Specific Parameter
stereoscopic image,	1 = Frame/Field Sequential (Figure 6, illustrates the composited frame format as transmitted by the source) Frame/Field Sequential Type:
	Value $0x0$: Left & Right view indication based on the MISC1 bit 2:1
	Value 0x1: Right when Stereo Signal = 1
	Value 0x2: Left when Stereo Signal = 1
	All other values for this field (0x3-0xF) are RESERVED for future use.
	2 = Stacked Frame (Figure 7, illustrates the composited frame format as transmitted by the source) Stacked Frame Type:
	Value 0x0: Left view is on top and right view on bottom
	All other values for this field (0x1-0xF) are RESERVED for future use.
	3 = Pixel Interleaved Interleave Pattern Type:
	For interleave pattern type 1 through 4, a 2x2 pattern

in a second mode, the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,

VESA DisplayPort Standard v1.2

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

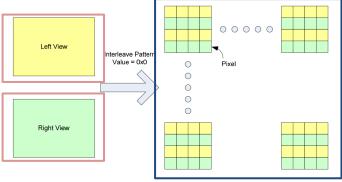


Figure 2-29: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines

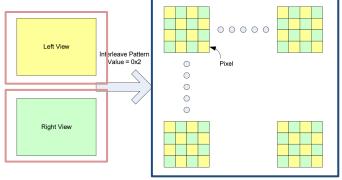


Figure 2-30: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines

in a second mode, the processor demultiplexes components of a stereoscopic image from a stream of second data elements which carry a multiplexed combination of components of a stereoscopic image,

VESA DisplayPort Standard v1.2

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

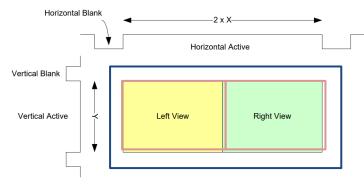


Figure 2-31: Interleave Pattern Corresponding to a Checkerboard Pattern with Alternating Left and Right Image Pixels

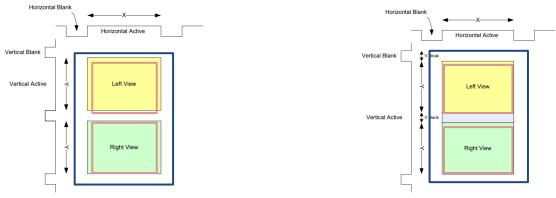
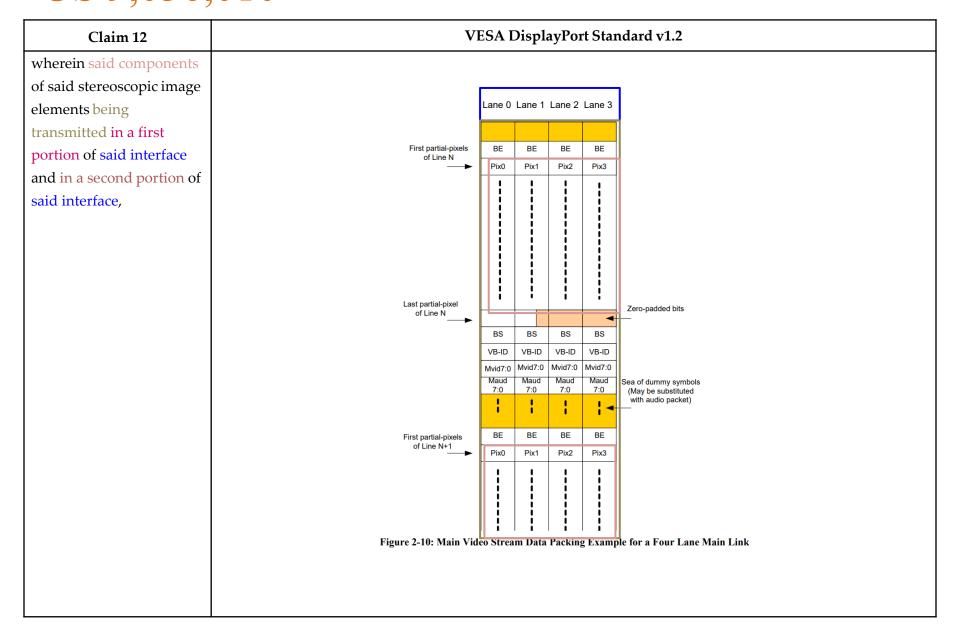


Figure 2-32: Field Sequential Stereo Format with Left View and Right View Indicated via MISC1 bits

Figure 2-33: Stacked Top, Bottom Stereo Format with Left View on Top and Right View on Bottom

2:1 Field of the MSA

VESA DisplayPort Standard v1.2	
•	acking n a pixel-within-lane manner as shown in Table 2-2. Pixel Steering into Main Link Lanes
Number of Lanes	Pixel Steering (N is 0 or positive integer)
4	Pixel 4N to lane 0 Pixel 4N+1 to lane 1 Pixel 4N+2 to lane 2 Pixel 4N+3 to lane 3
2	Pixel 2N to lane 0 Pixel 2N+1 to lane 1
1	All pixels to lane 0
•	2.2.1.3 Main Video Stream Data P The link layer must first steer pixel data i Table 2-2: Number of Lanes 4



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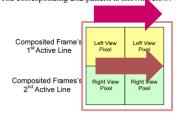
wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

2.2.5.6 Video Stream Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

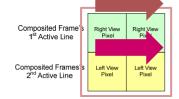
Value 0x0:

Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on even lines. The corresponding 2x2 pattern is shown below:



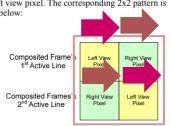
Value 0x1:

Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on odd lines. The corresponding 2x2 pattern is shown clow:

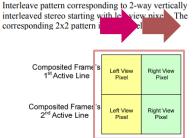


Value 0x2:

Interleave pattern corresponding to a checkerboard pattern with alternating left and right view pixels starting with left view pixel. The corresponding 2x2 pattern is shown below:



Value 0x3:



Value 0x4:

Interleave pattern corresponding to 2-way vertically interleaved stereo starting with right view pixels. The corresponding 2x2 pattern is shown below:

Composited Frame S Right View Pixel Left View Pixel Pixel Left View Pixel Pi

wherein said components of said stereoscopic image elements being transmitted in a first portion of said interface and in a second portion of said interface,

VESA DisplayPort Standard v1.2

2.2.5.6 Video_Stream_Configuration (VSC) Packet

A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.

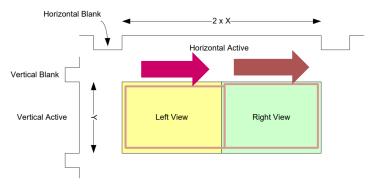


Figure 2-31: Interleave Pattern Corresponding to a Checkerboard Pattern with Alternating Left and Right Image Pixels

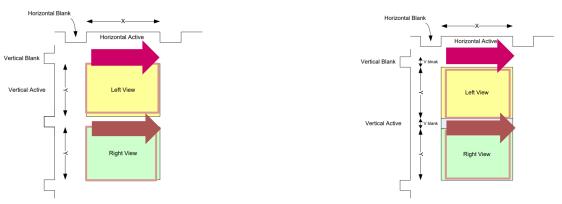


Figure 2-32: Field Sequential Stereo Format with Left View and Right View Indicated via MISC1 bits

Figure 2-33: Stacked Top, Bottom Stereo Format with Left View on Top and Right View on Bottom

2:1 Field of the MSA

VESA DisplayPort Standard v1.2 Claim 12 wherein said components of said stereoscopic image Value 0x0: elements being Lane 0 Lane 1 Lane 2 Lane 3 Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on even transmitted in a first lines. The corresponding 2x2 pattern is shown below: First partial-pixels BE BE BE BE portion of said interface of Line N Pix2 Pix3 and in a second portion of said interface, Composited Frame's Left View Left View 1st Active Line Pixel Pixel Composited Frames's Right View Right View 2nd Active Line Pixel Pixel Last partial-pixel o-padded bits of Line N BS VB-ID VB-ID VB-ID VB-ID Mvid7:0 Mvid7:0 Mvid7:0 Maud Maud Maud Maud Sea of dummy symbols (May be substituted 00000 7:0 7:0 7:0 7:0 Left View with audio packet) nterleave Pattern Value = 0x0BE BE First partial-pixels of Line N+1 Pix0 Pix1 Pix2 Pix3 Right View Figure 2-29: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels are on Even Lines Figure 2-10: Main Video Stream Data Packing Example for a Four Lane Main Link

Claim 12 VESA DisplayPort Standard v1.2 wherein said components Value 0x2: of said stereoscopic image Interleave pattern corresponding to a checkerboard elements being Lane 0 Lane 1 Lane 2 Lane 3 pattern with alternating left and right view pixels starting with left view pixel. The corresponding 2x2 pattern is transmitted in a first shown below: First partial-pixels BE BE BE portion of said interface of Line N Pix0 Pix2 Pix3 and in a second portion of said interface, Composited Frame's Left View Right View 1st Active Line Pixel Pixel Composited Frames's Right View Left View 2nd Active Line Pixel Pixel Last partial-pixel Zero-padded bits of Line N BS VB-ID VB-ID VB-ID VB-ID Mvid7:0 Mvid7:0 Mvid7:0 00000 Maud Maud Maud Maud Sea of dummy symbols (May be substituted 7:0 7:0 7:0 7:0 terleave Pattern with audio packet) BE First partial-pixels of Line N+1 Pix0 Pix2 Pix3 Right View Figure 2-30: Interleave Pattern Corresponding to 2-way Interleaved Stereo where Right Image Pixels Figure 2-10: Main Video Stream Data Packing Example for a Four Lane Main Link

Claim 12	VESA DisplayPort Standard v1.2	
each of said first portion		
and said second portion	1.7.1 Make-up of the Main Link	
having a lesser data	The Main Link consists of one, two or four AC-coupled, doubly terminated differential pairs (called lanes).	
carrying capacity than	AC-coupling facilitates the silicon process migration since the DisplayPort transmitter and receiver may have different common mode voltages.	
said known data carrying	The stream data is packed into "micro-packets" which are called "transfer units" in SST (Single Stream	
capacity and a combined	Transport) mode and MTP (Multi-stream Transport Packet) in MST (Multi-Stream Transport) mode. After	
data carrying capacity no	the stream data is packed and mapped to main link, the packed stream data rate will be equal to or smaller than the link symbol rate of the main link. When it is smaller, stuffing symbols are inserted.	
greater than said known	than the link symbol rate of the main link. When it is smaller, starting symbols are inserted.	
data carrying capacity,	2.2.1.4 Symbol Stuffing and Transfer Unit	
	2.2.1.4 Symbol Stuffing and Transfer Unit To avoid the oversubscription of the link bandwidth, the packed data rate must be equal to or lower than the link symbol rate. When the packed data rate is lower than the link symbol rate, the link layer must perform symbol stuffing. Stuffing symbols (both stuffing frame symbols and dummy data symbols) must be inserted in all lanes in the same LS_Clk cycle before inter-lane skewing. The dummy data symbols must be all 00h before scrambling. The dummy data symbols are inserted both between FS and FE, and between BS and BE.	

Claim 12	VESA DisplayPort Standard v1.2	
the interface part further	2.2.4 Main Stream Attribute Data Transport	
arranged to receive	This section describes the Main Stream attribute data that are transported for the reproduction of the main	
signaling information	video stream by the Sink. The attribute data is sent once per frame during the vertical blanking period of the	
across the interface, the	main video stream. Those attributes must be as follows:	
signaling information	Miscellaneous1 (MISC1, 8 bits)	
identifying which of said	 00 = No 3D stereo video in-band signaling done using this field, indicating either no 3D 	
first mode and said	stereo video transported or the in-band signaling done using an SDP called	
second mode is used and	Video_Stream_Configuration (VSC) Packet	
characteristics of said	• 01	
steam of second data	For progressive video, the next frame is RIGHT EYE	
elements.	 For interlaced video, TOP field is RIGHT EYE and BOTTOM field is LEFT EYE 	
	■ 10 = RESERVED	
	• 11	
	 For progressive video, the next frame is LEFT EYE 	
	 For interlaced video, TOP field is LEFT EYE and BOTTOM field is RIGHT eye 	
	2.2.5.6 Video Stream Configuration (VSC) Packet	
	A DP Source device may send 3D Stereo in-band signaling using VSC Packet by setting MSA Packet MISC1 field bits 2:1 to 00.	

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Claim 12
the interface part further
arranged to receive
across the interface, the
identifying which of said
first mode and said
second mode is used and
characteristics of said
steam of second data
elements.

VESA DisplayPort Standard v1.2

2.2.5.6 Video_Stream_Configuration (VSC) Packet

A DP Source device may <u>send 3D Stereo in-band signaling using VSC Packet</u> by setting MSA Packet MISC1 field bits 2:1 to 00.

2.2.5.6.2 VSC Packet Payload

Table below shows the bit definitions of VSC Packet payload

Table 2-56: VSC Packet Payload

DB0 bits 3:0	DB0 bits 7:4
= Stereo Interface Method Code	= Stereo Interface Method-Specific Parameter
0 = Non Stereo Video	Must be set to 0x0
1 = Frame/Field Sequential (Figure 6, illustrates the	Frame/Field Sequential Type:
composited frame format as transmitted by the source)	
	Value 0x0:
	Left & Right view indication based on the MISC1 bit
	2:1
	Value 0x1:
	Right when Stereo Signal = 1
	Value 0x2:
	Left when Stereo Signal = 1
	Lett when stelled signal
	All other values for this field (0x3-0xF) are RESERVED
	for future use.
2 = Stacked Frame (Figure 7, illustrates the composited	Stacked Frame Type:
frame format as transmitted by the source)	Stacked Frame Type.
frame format as transmitted by the source)	
	Value 0x0:
	Left view is on top and right view on bottom
	Left view is on top and right view on bottom
	All other values for this field (0x1-0xF) are RESERVED
	for future use
3 = Pixel Interleaved	101 144410 4301
5 - Pixel Intelleaved	Interleave Pattern Type:
	For interleave pattern type 1 through 4, a 2x2 pattern

Claim 12 VESA DisplayPort Standard v1.2 the interface part further arranged to receive grid (as shown in figure 2) is used to illustrate the interleaving pattern of the composited stereo frame. Composited Frame's 1st Active Line across the interface, the Interleave pattern corresponding to 2-way horizontally interleaved stereo where right view pixels are on even Composited Frames's lines. The corresponding 2x2 pattern is shown below: Right View Pixel 2nd Active Line identifying which of said Value 0x4: Composited Frame's Interleave pattern corresponding to 2-way vertically 1st Active Line first mode and said interleaved stereo starting with right view pixels. The corresponding 2x2 pattern is shown below: Composited Frames's second mode is used and 2nd Active Line Composited Frame's characteristics of said 1st Active Line Value 0x1: Interleave pattern corresponding to 2-way horizontally steam of second data interleaved stereo where right view pixels are on odd Composited Frames's lines. The corresponding 2x2 pattern is shown below: 2nd Active Line elements. Composited Frame's All other values for this field (0x5-0xF) are RESERVED for future use. 4 = Side-by-side (Figure 5, illustrates the composited Composited Frames's flame format and the timing requirement) A value of 0x0 indicate left half of the image represents 2nd Active Line left EYE view and right half represents right EYE view A value of 0x1 indicate left half of the image represents Interleave pattern corresponding to a checkerboard right EYE view and right half represents left EYE view pattern with alternating left and right view pixels starting with left view pixel. The corresponding 2x2 pattern is All other values for this field (0x2-0xF) are RESERVED shown below for future use. Values 0x5-0xF are RESERVED Composited Frame's 1st Active Line Composited Frames's 2nd Active Line Interleave pattern corresponding to 2-way vertically interleaved stereo starting with left view pixels. The corresponding 2x2 pattern is shown below: